



**BEFORE THE PUBLIC UTILITIES COMMISSION  
OF THE STATE OF CALIFORNIA**

**FILED**

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Application of PACIFIC GAS AND  
ELECTRIC COMPANY, a California  
corporation, for a Permit to Construct the  
Crazy Horse Canyon Switching Station Project  
Pursuant to General Order 131-D

Application No.

**A1004031**

(U 39 E)

**APPLICATION OF PACIFIC GAS AND ELECTRIC COMPANY  
FOR A PERMIT TO CONSTRUCT THE  
CRAZY HORSE CANYON SWITCHING STATION PROJECT**

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April 30, 2010

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Pursuant to Section IX(B) of General Order (“GO”) 131-D and Rules 2.1 through 2.5 and 3.1 of the California Public Utilities Commission’s (“Commission” or “CPUC”) Rules of Practice and Procedure, PACIFIC GAS AND ELECTRIC COMPANY (“PG&E”) respectfully requests a Permit to Construct (“PTC”) the Crazy Horse Canyon Switching Station Project (“project”), a new switching station and associated power line modifications in Monterey County. The project is needed to improve electric system reliability and increase operational flexibility for the central and northern areas of Monterey County and northern San Benito County, including the communities of Hollister, San Juan Bautista, Prunedale, Soledad and Salinas.

**I. BACKGROUND**

The existing Moss Landing-Salinas-Soledad Nos. 1 and 2 115 kilovolt (“kV”) Power Lines extend to the project area from the Moss Landing Power Plant, and split at the existing Lagunitas Switch, located about 850 feet west of the proposed switching station. The Moss Landing-Salinas-Soledad Nos. 1 and 2 115 kV Power Lines extend north from Lagunitas Switch to serve San Jan Bautista and Hollister (feeding the Hollister Nos. 1 and 2 115 kV Power Lines) and south from Lagunitas Switch to serve Salinas and Soledad. These power lines span more than 55 miles and are the primary sources of power for the communities of Hollister, San Juan Bautista, Prunedale, and Soledad and sections of the City of Salinas. These power lines have had

reliability issues due to their long length and the terrain over which the lines are located.

Currently, when an outage occurs on one circuit, the entire 55-mile line must be de-energized.

The Crazy Horse Canyon Switching Station Project proposes to ameliorate this situation by constructing a new switching station and associated power line modifications. (See Proponent’s Environmental Assessment (“PEA”),<sup>1</sup> Exhibit A). Construction of a switching station gives PG&E a more reliable and robust transmission system configuration in the region, and provides system operators more speed and flexibility by simplifying switching through automation. This capability does not currently exist along the power lines that serve this area of Monterey and San Benito counties. The proposed switching station site is located approximately 0.5 miles northeast of the intersection of Crazy Horse Canyon Road and San Juan Grade Road, north of the City of Salinas in Monterey County.

## **II. REGIONAL CONTEXT AND PROJECT COMPONENTS**

### **A. Regional Context**

#### **1. Existing Regional Electric System**

The Moss Landing Power Plant is the primary electrical generation source for the region. Electric power is transmitted regionally from the plant at voltages of 500 kV, 230 kV, 115 kV, and 60 kV. The power is then stepped down at substations and distributed to customers using overhead or underground distribution lines. Within this electrical transmission system, switching stations act as “network stations,” which connect together several different power lines into a common bus, enabling more “source” lines to supply local distribution substations. A switching station allows PG&E to use an automated control system to seamlessly switch load from one power line to another in the event of scheduled

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<sup>1</sup> The PEA is attached as Exhibit A to this application and incorporated herein by reference. References to PEA figures refer to figures within this exhibit.

maintenance or an unanticipated outage on one of the lines. The station “sectionalizes” long power lines into shorter sections. By sectionalizing lines, potential impacts from outages are experienced by fewer customers, and some outages will not impact any customers.

The location of the proposed switching station is near the Lagunitas Switch, where the existing Moss Landing-Salinas-Soledad 115 kV Power Lines come from Moss Landing Power Plant and split north and south as two, double-circuit 115 kV lines. These 115 kV power lines (including the Hollister Nos. 1 and 2 Power Lines that tap off of the northern Moss Landing-Salinas-Soledad segment) provide power to central and northern Monterey County and northern San Benito County.

## **B. Project Components**

PG&E proposes to construct and operate the Crazy Horse Canyon Switching Station and associated power line modifications. Major elements of the switching station, which are described in more detail in the following sections, include:

- Four 115 kV dead-end structures,
- Four 115 kV double dead-end structures,
- Twenty capacitor couple voltage transformers and structures,
- Twenty-four 115 kV disconnect switches,
- Sixteen 115 kV bus structures,
- Nine 115 kV circuit breakers,
- One MPAC building (to house the protection and control systems),
- One battery building (to provide back-up station power), and
- One permanent paved access road from San Juan Grade Road to the switching station (approximately 750 feet long).

The associated power line modifications include:

- Constructing temporary shoo-fly structures that support the power conductors during project construction, and

- Rearranging the existing 115 kV electric power circuits by removing four existing lattice steel towers and installing six new lattice steel tower structures and five new tubular steel poles.

### **1. Switching Station**

Due to the slope of the site, construction of the switching station will require establishing a 5.2-acre, flat pad to accommodate both the switching station facilities and the temporary construction work area. A typical switching station layout and a corresponding profile is provided in Figures 1-4 and 1-5 of the PEA.

### **2. Power Line Reconfiguration**

The project will require rearranging the existing power lines in the immediate area of the proposed new switching station. To accomplish this, PG&E will install six new lattice steel tower structures and five new tubular steel poles and remove four existing lattice steel towers. The new lattice steel towers will be approximately 78 to 125 feet tall, and the tubular steel poles will be approximately 60 to 95 feet tall.

The existing Moss Landing-Salinas-Soledad Nos. 1 and 2 115 kV Power Lines extend to the project area from the Moss Landing Power Plant and split at the existing Lagunitas Switch, located about 850 feet west of the proposed switching station, with the Moss Landing-Salinas-Soledad Nos. 1 and 2 115 kV Power Lines extending north from Lagunitas Switch to serve San Juan Bautista and Hollister (feeding the Hollister Nos. 1 and 2 115 kV Power Lines) and south from Lagunitas Switch to serve Salinas and Soledad. The Lagunitas Switch consists of a single lattice steel tower with manual mechanical disconnect switches. As part of the power line reconfiguration, the Lagunitas Switch tower will be removed, and the three segments of the existing 115 kV power lines will be extended into the Crazy Horse Canyon Switching station. No new lines will be added; the lines will enter and exit the new switching station the same way they met at the Lagunitas Switch, but they will be

sectionalized at the switching station so that they operate as six independent circuits. Two circuits (the Moss Landing-Crazy Horse Nos. 1 and 2 115 kV Power Lines) will enter the switching station from Moss Landing Power Plant, two circuits (Crazy Horse Canyon-Hollister Nos. 1 and 2 115 kV Power Lines) will continue north of the switching station, connecting at the existing tower structure approximately 1,400 feet north of the switching station, and two circuits (Crazy Horse Canyon-Salinas-Soledad Nos. 1 and 2 115 kV Power Lines) will continue to the south, connecting at the existing tower structure near the ridgetop, approximately 1,500 feet from the switching station.

### **3. Access and Construction Work Areas**

Access to the switching station site and power line reconfiguration work area during construction will be from San Juan Grade Road and Crazy Horse Canyon Road. PG&E will construct a 16-foot wide permanent asphalt access road from San Juan Grade Road to the switching station. Access to the power line reconfiguration work area will be through an existing gate and twin-track road currently used by a local rancher for farming and by PG&E to access the Lagunitas Switch. Access to two of the temporary pull sites will require traversing approximately 30 feet of pastureland from Crazy Horse Canyon Road to a 2.0-acre temporary pull site, and from the new permanent access to a 1.0-acre temporary pull site. A third, 2.0-acre pull site will be located northwest of new tower location 0/4. It will be accessed by an existing dirt road.

### **III. THE APPLICANT**

Since October 10, 1905, PG&E has been an operating public utility corporation, organized under the laws of the State of California. PG&E is engaged principally in the business of furnishing gas and electric service in California. PG&E's principal place of business is 77 Beale Street, San Francisco, California 94105.

Communications with regard to this Application should be addressed to:

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Incorporated herein by reference is a certified copy of PG&E's Articles of Incorporation, effective April 12, 2004, which was filed with the Commission in connection with PG&E's Application No. A.04-05-005 on May 3, 2004.

A copy of PG&E's most recent proxy statement was filed with the Commission on April 9, 2010, in Application 10-04-017, and is incorporated herein by reference. Copies of PG&E's most recent financial statements (contained in the Form 10-Q Quarterly Report filed on February 19, 2010, by PG&E Corporation and the Pacific Gas and Electric Company for the period ending December 31, 2009) were filed with the Commission in connection with PG&E's Application No. A.10-02-028, filed on February 26, 2010, and are incorporated herein by reference.

**IV. ADDITIONAL INFORMATION REQUIRED BY SECTION IX(B) OF GO 131-D:**

Pursuant to Rule 2.4 (b) of the Commission's Rules of Practice and Procedure, PG&E has submitted a Proponent's Environmental Assessment, which is attached as Exhibit A to this Application. The following information is required by Section IX.B of GO 131-D:

- a. *A description of the proposed power line and substation facilities, including the proposed power line route; proposed power line equipment, such as tower design and appearance, heights, conductor sizes, voltages, capacities, substations, switchyards, etc., and a proposed schedule for authorization, construction, and commencement of operation of the facilities.*

A detailed description of the proposed project and equipment is contained in Section II.B above and in Chapter 1 of the PEA, Exhibit A. A Preliminary Project Schedule is attached as Exhibit C.

- b. *A map of the proposed power line routing or substation location showing populated areas, parks, recreational areas, scenic areas, and existing electrical transmission or power lines within 300 feet of the proposed route or substation.*

A project map is attached as Exhibit B and maps showing area transmission lines are provided in Figures 1-2a and 1-2b of the PEA, attached as Exhibit A. No populated areas, parks, recreational areas, or scenic areas are located within 300 feet of the proposed switching station.

- c. *Reasons for adoption of the power line route or substation location selected, including comparison with alternative routes or locations, including the advantages and disadvantages of each.*

PG&E evaluated several alternatives before selecting the proposed project site. The reasons for adopting this site as the preferred site are detailed in Chapter 2 of the PEA, Exhibit A. The project site was chosen due its proximity to the existing power lines, its less-visible location, and the stated preference for this location by the County of Monterey.

- d. *A listing of the governmental agencies with which proposed power line route or substation location reviews have been undertaken, including a written agency response to applicant's written request for a brief position statement by that agency. (Such listing shall include The Native American Heritage Commission, which shall constitute notice on California Indian Reservation Tribal governments.) In the absence of a written agency position statement, the utility may submit a statement of its understanding of the position of such agencies.*

#### **United State Fish and Wildlife Service (“USFWS”)**

On March 3, 2010, PG&E met with USFWS to provide staff with a brief overview of the project and specifically discuss the presence of California Tiger Salamander (“CTS”).

USFWS advised PG&E that, although a Section 7 consultation under the federal Endangered Species Act would be required, there would be no compensatory mitigation required.

**U.S. Army Corps of Engineers (“USACOE”)**

On July 7, 2009, PG&E met with USACOE on the project site to discuss wetlands and drainages. The USACOE advised PG&E that they would take jurisdiction over two intermittent drainages and two wetlands.

**California Department of Fish and Game (“CDFG”)**

On March 3, 2010, PG&E met with CDFG to provide staff with a brief overview of the project and specifically discuss the presence of CTS. CDFG advised PG&E that the state listing of CTS was imminent, and that PG&E would likely need an incidental take permit under Section 1081 of the California Fish and Game Code. Compensatory mitigation would likely be required.

**County of Monterey**

In January 2008, PG&E met with the Monterey County Planning Director to discuss concerns regarding central coast reliability issues and the need for a switching station. At that time, PG&E proposed a switching station located at the top of the hill adjacent to the convergence of the Moss Landing-Salinas-Soledad Nos. 1 and 2 115 kV Power Lines. The Planning Director expressed concerns regarding visual impacts at this location and requested that PG&E explore locating the switching station over the hill to the east (in the valley between two hill crests) where visibility would be limited. PG&E engineers eventually determined that constructing a switching station near the County’s preferred site would be feasible, and PG&E proceeded to design a proposed project at this location. PG&E met with County officials several times during this process.

On March 16, 2010, PG&E met with representatives of the County of Monterey's Public Works Department to discuss the location of the access road and setbacks from San Juan Grade Road. The County advised PG&E that the current plans were consistent with encroachment rules and regulations set by the County.

On February 8, 2010, PG&E met with the Monterey County Board of Supervisors' supervisor for the project area. At that meeting, the supervisor indicated his support for the project and its location, and subsequently brought the project before the Board of Supervisors. On April 13, 2010, the Board of Supervisors voted to support the project in the proposed location and to submit a letter to the CPUC. A copy of that letter is included as Attachment A to the PEA.

#### **The Native American Heritage Commission ("NAHC")**

The NAHC was consulted to determine if any cultural resource sites recorded in the Commission's Sacred Lands File occur in or near the Project area. The NAHC responded that a search of the Sacred Lands file housed at the NAHC did not result in the identification of any sacred lands within the project area and provided a list of local groups and individuals to contact for further information regarding local knowledge of sacred lands. Additional follow-up was completed as suggested. All correspondence on this issue is included in the PEA as Attachment D.

#### **V. MEASURES TAKEN TO REDUCE EMF EXPOSURE**

Section X(A) of GO 131-D requires that applications for a PTC include a description of the measures taken or proposed by the utility to reduce the potential exposure to electric and magnetic fields ("EMF") generated by the proposed facilities. In accordance with CPUC Decision No. D.06-01-042 ("EMF Decision"), and PG&E's EMF Design Guidelines ("EMF Design Guidelines") prepared in accordance with the EMF Decision, PG&E's project is exempt

from incorporating “no-cost” and “low-cost” magnetic field reduction steps into the design of the proposed switching station and related facilities. The EMF Decision provides that “[l]ow-cost EMF mitigation is not necessary in agricultural and undeveloped land except for permanently occupied residences, schools or hospitals located on these lands.” (EMF Decision at 20; *see also* EMF Design Guidelines at 2.) The EMF Design Guidelines include under transmission and substation projects exempt from consideration of “no-cost” and “low-cost” mitigation:

5. Projects located exclusively adjacent to undeveloped land—including land under the jurisdiction of the National Park Service, the State Department of Parks and Recreation, U.S. Forest Service, or Bureau of Land Management (BLM).

(EMF Design Guidelines at 11.) Because the project is surrounded by undeveloped agricultural land, it is exempt, and no Field Management Plan is required. A copy of the EMF Design Guidelines is attached as Exhibit D.

## **VI. PUBLIC NOTICE**

Pursuant to Section XI(A) of GO 131-D, notice of the Application will be sent to the Planning Commission and Board of Supervisors for Monterey County, the California Energy Commission, the State Department of Transportation and its Division of Aeronautics, the Secretary of the Resources Agency, the Department of Fish and Game, the Department of Public Health, the California Water Resources Control Board, the Air Resources Board, the Monterey Bay Unified Air Pollution Control District, the Central Coast Regional Water Quality Control Board, the Native American Heritage Commission, the State Department of Transportation’s District Office, the U.S. Fish and Wildlife Service, all owners of land within 300 feet of the proposed project (as determined by the most recent local assessor’s parcel roll available to PG&E at the time the notice is sent), and any other interested parties that have requested such notification.

In accordance with Section XI(A)(2), within ten days after filing the application, PG&E will publish notice of the application once a week for two successive weeks in the Monterey County Herald. In accordance with Section XI(A)(3), PG&E will also post a notice of the application on-site and off-site where the proposed substation and distribution facilities are located. PG&E will deliver a copy of the notice to the CPUC Public Advisor and the CPUC's Energy Division in accordance with Section XI(A)(3), and will file a declaration of mailing and posting with the Commission within five days after completion.

## **VII. REQUEST FOR TIMELY ACTION**

As described in Exhibit C, PG&E's Preliminary Project Schedule, the Project must be complete and operational by December 31, 2012, in order to ensure the ability of the system to safely and reliably serve the area without interruptions or emergency conditions. To meet these operations requirements, PG&E must begin construction by June 2011.

Given this pressing need and the lack of anticipated environmental issues or public controversy connected with this Project, PG&E respectfully requests a streamlined review and approval of this application.

## **VIII. EXHIBITS**

The following exhibits are attached and incorporated by reference to this application:

Exhibit A: Crazy Horse Canyon Switching Station Project PEA

Exhibit B: Project Map

Exhibit C: Preliminary Project Schedule

Exhibit D: EMF Design Guidelines

**IX. CONCLUSION**

WHEREFORE, Applicant Pacific Gas and Electric Company respectfully requests that the Commission issue an order pursuant to GO 131-D, effective immediately, granting PG&E a Permit to Construct the Crazy Horse Canyon Switching Station Project.

Dated in San Francisco, California, this 30<sup>th</sup> day of April, 2010.

Respectfully submitted,

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By:           /s/ Jo Lynn Lambert            
          JO LYNN LAMBERT

Attorneys for Applicant  
PACIFIC GAS AND ELECTRIC COMPANY

## SCOPING MEMO INFORMATION

### Category:

Ratesetting. Pursuant to Rule 2.1(c) of the Commission's Rules of Practice and Procedure, the application must propose a category for the proceeding as defined in Rule 1.3. If none of the enumerated categories are applicable, proceedings will be categorized under the catch-all "ratesetting" category. (CPUC Rule 7.1 (e)(2).) The Commission has consistently found that applications for CPCNs and PTCs under GO 131-D do not fit within any of the enumerated categories and should therefore be considered as "ratesetting proceedings."

### Need for hearing:

The CPUC has determined that issues related to project need and cost are not within the scope of PTC applications, leaving only environmental review as a relevant issue. No areas of environmental or other public concern are known. If concerns about the project are raised, PG&E recommends that a public participation hearing be held.

### Issues:

None known.

### Proposed Schedule:

See Exhibit C, attached.

**VERIFICATION**

I, the undersigned, declare:

I am an officer of PACIFIC GAS AND ELECTRIC COMPANY, a corporation, and am authorized to make this verification on its behalf. The statements in the foregoing document are true of my own knowledge, except as to matters which are therein stated on information or belief, and as to those matters I believe them to be true.

I declare under penalty of perjury that the foregoing is true and correct.

Executed on April 27, 2010, at San Francisco, California.

*/s/ Des Bell*

Des Bell

Senior Vice President Shared Service and  
Chief Procurement Officer

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**EXHIBIT A**

**PROPONENT'S ENVIRONMENTAL ASSESSMENT**

**[Proponent's Environmental Assessment (PEA) was filed separately in paper form]**

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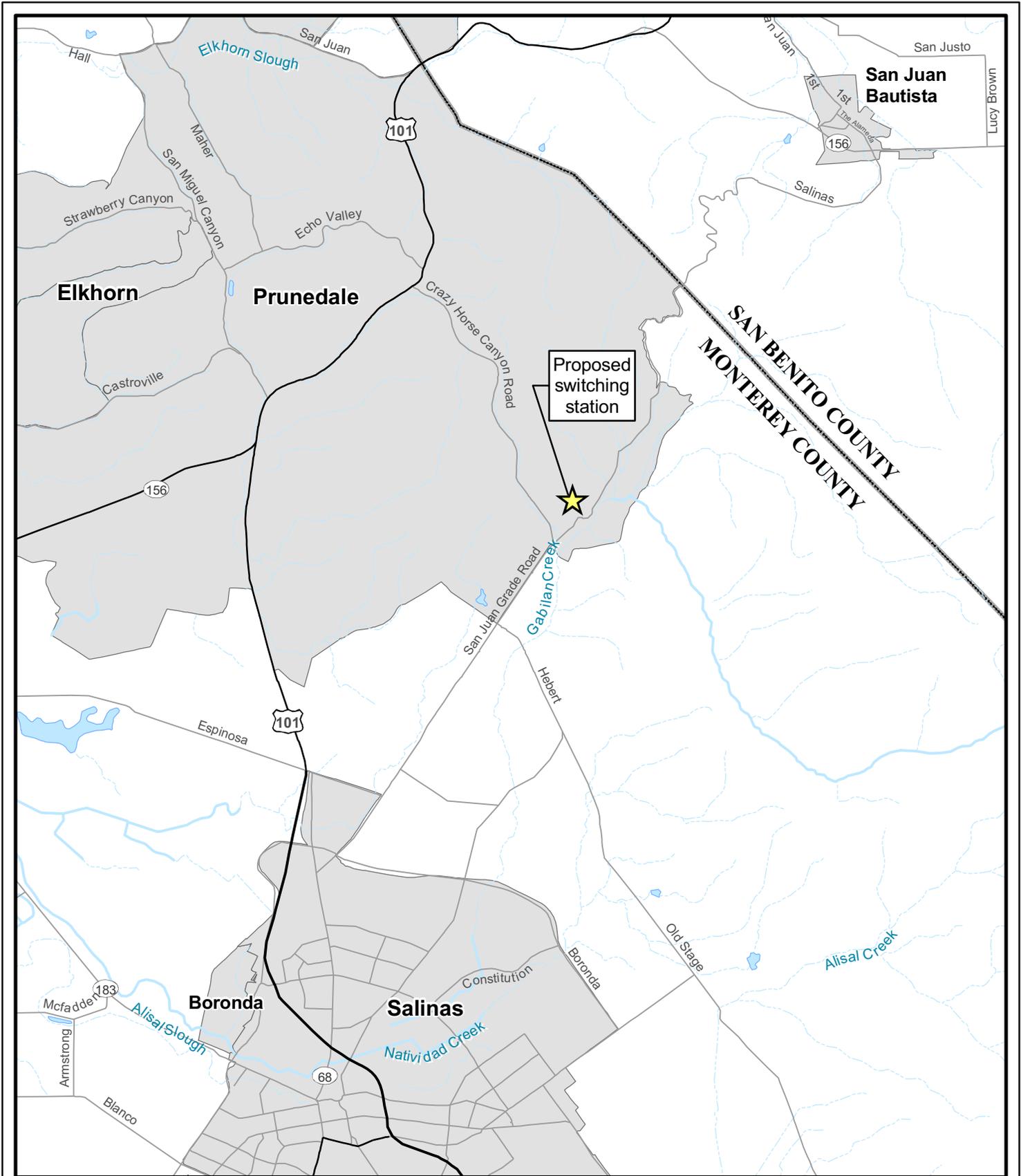
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**EXHIBIT B**

**PROJECT MAP**



**Exhibit B**  
Project Overview Map  
Crazy Horse Canyon Switching Station

0 0.5 1 2 Miles

Scale = 1:100,000



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**EXHIBIT C**

**PRELIMINARY PROJECT SCHEDULE**

## Exhibit C

### CRAZY HORSE CANYON SWITCHING STATION PROJECT PRELIMINARY PROJECT SCHEDULE

PTC Application submitted	April 30, 2010
Preliminary CPUC review, notice of deficiencies if any, or application complete if none	June 1, 2010
Response to deficiencies (if any)	June 30, 2010
Application complete (if deficiencies)	July 30, 2010
Draft Mitigated Negative Declaration Released	September 29, 2010
Public Review Period Begins	September 29, 2010
Close of Public Review Period	October 29, 2010
Mitigated Negative Declaration completed and adopted (no later than 180 days, or 6 months) from complete application per CEQA Guidelines 15107)	December 16, 2010
PTC Decision Adopted and Effective	December 16, 2010
Acquisition of Required Permits	June 2010–June 2011
Materials Procurement (long lead)	June 2008–June 2011
Construction Begins	July 2011
Construction Complete	December 31, 2012
Project Operational	December 31, 2012

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**EXHIBIT D**

**EMF DESIGN GUIDELINES FOR ELECTRICAL FACILITIES**

# EMF Design Guidelines for Electrical Facilities

## 1 California EMF Policy

### 1.1 Historical Background of California EMF Policy

In 1993, the California Public Utilities Commission (CPUC) issued Decision 93-11-013, establishing EMF policy for California's regulated electric utilities.

The Decision acknowledged that scientific research had not demonstrated that exposures to EMF cause health hazards and that it was inappropriate to set numeric standards that would limit exposure. In recognizing the scientific uncertainty, the CPUC addressed public concern over EMF by establishing a no-cost and low-cost EMF reduction policy that utilities would follow for proposed electrical facilities.

In workshops ordered by the CPUC, the utilities developed the initial EMF Design Guidelines based upon the no-cost and low-cost EMF policy. Fundamental elements of the policy and the Design Guidelines included the following:

- A) No-cost and low-cost magnetic field reduction measures would be considered on new and upgraded projects.
- B) Low-cost measures, in aggregate, would:
  - a. Cost in the range of 4% of the total project cost.
  - b. Achieve a noticeable magnetic field reduction.

The CPUC stated,

“We direct the utilities to use 4 percent as a benchmark in developing their EMF mitigation guidelines. We will not establish 4 percent as an absolute cap at this time because we do not want to arbitrarily eliminate a potential measure that might be available but costs more than the 4 percent figure. Conversely, the utilities are encouraged to use effective measures that cost less than 4 percent.”<sup>1</sup>

- C) For distribution facilities, utilities would apply no-cost and low-cost measures by integrating reduction measures into construction and design standards, rather than evaluating no-cost and low-cost measures for each project.

### 1.2 Current California EMF Policy

In 2006, the CPUC updated its EMF Policy in Decision 06-01-042. The decision re-affirmed that health hazards from exposures to EMF have not been established and that state and federal public health regulatory agencies have determined that setting numeric exposure limits is not appropriate. The CPUC also re-affirmed that the existing no-cost and low-cost precautionary-

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<sup>1</sup> CPUC Decision 93-11-013, Section 3.3.2, p.10

based EMF policy should be continued. In the decision, the CPUC required the utilities to update their EMF Design Guidelines to reflect the following key elements of the updated EMF Policy:

- A) “The Commission [CPUC] has exclusive jurisdiction over issues related to EMF exposure from regulated utility facilities.”<sup>2</sup>
- B) “...while we continue our current policy of low-cost and no cost EMF mitigation, as defined by a 4% benchmark of total project cost, we would consider minor increases above the 4% benchmark if justified under unique circumstances, but not as a routine application in utility design guidelines. We add the additional distinction that any EMF mitigation cost increases above the 4% benchmark should result in significant EMF mitigation to be justified, and the total costs should be relatively low.”<sup>3</sup>
- C) For low cost mitigation, the “EMF reductions will be 15% or greater at the utility ROW [right-of-way]...”<sup>4</sup>
- D) “Parties generally agree on the following group prioritization for land use categories in determining how mitigation costs will be applied:
  - 1. Schools and licensed day care<sup>5</sup>
  - 2. Residential
  - 3. Commercial/industrial
  - 4. Recreational
  - 5. Agricultural
  - 6. Undeveloped land”
- E) “Low-cost EMF mitigation is not necessary in agricultural and undeveloped land except for permanently occupied residences, schools or hospitals located on these lands.”<sup>6</sup>
- F) “Although equal mitigation for an entire class is a desirable goal, we will not limit the spending of EMF mitigation to zero on the basis that not all class members can benefit.”<sup>7</sup>
- G) “.... We [CPUC] do not request that utilities include non-routine mitigation measures, or other mitigation measures that are based on numeric values of EMF exposure, in revised design guidelines...”<sup>8</sup>

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<sup>2</sup> CPUC Decision 06-01-042, p. 21

<sup>3</sup> Ibid., p. 7

<sup>4</sup> Ibid., p. 10

<sup>5</sup> “As an additional fixed location of young children, we will add hospitals to this category.” Ibid., p. 7

<sup>6</sup> Ibid., p. 20

<sup>7</sup> Ibid., p. 10

<sup>8</sup> Ibid., p. 17

The CPUC also clarified utilities’ roles on EMF during the CPCN (Certificate of Public Convenience and Necessity) and PTC (Permit to Construct). The CPUC stated,

“EMF concerns in future CPCN [Certificate of Public Convenience and Necessity] and PTC [Permit to Construct] proceedings for electric transmission and substation facilities should be limited to the utility’s compliance with the Commission’s [CPUC] low-cost and no-cost policies.”<sup>9</sup>

Furthermore, the CPUC directed “the Commission’s Energy Division to monitor and report on new EMF related scientific data as it becomes available.”<sup>10</sup> These EMF Design Guidelines, therefore, will be revised as more information or direction from the CPUC becomes available.

### 1.2.1 Standardized EMF Design Guidelines

Decision 06-01-042 directed the utilities to hold a workshop to develop standard approaches for their EMF Design Guidelines. This workshop was held in spring of 2006, and this document represents the standardized design guidelines produced as a result of that workshop. The guidelines describe the routine magnetic field reduction measures that all regulated California electric utilities will consider for new and upgraded transmission line and transmission substation projects.

These guidelines are not applied to changes made in connection with routine maintenance, emergency repairs, or minor changes to existing facilities. See §3.4 for a list of exemptions.

### 1.2.2 Standardized Table of Magnetic Field Reduction Measures

As directed by Decision 06-01-042, these guidelines include a standardized table that utilities will use to summarize "the estimated costs and reasons for adoption or rejection"<sup>11</sup> of reduction measures considered for any particular project. Table 1-1 shows the information to be displayed in the standardized table. Utilities may choose to add columns for additional information as necessary for any particular project. Typical format is shown below.

**Table 1-1 Low-Cost Reduction Measures Adopted or Rejected**

Project Segment	Location (Street, Area)	Adjacent Land Use	Reduction Measure Considered	Measure Adopted? (Yes/No)	Reason(s) if not adopted	Estimated Cost to Adopt
		Per §1.2-D	Per § 2			

<sup>9</sup> Ibid., p. 21

<sup>10</sup> Ibid., p. 16

<sup>11</sup> Ibid., p. 13.

### 1.2.3 Additional Considerations Used in the Design Guidelines

These additional elements of policy resulting from Decisions 93-11-013 and 06-01-042 are fundamental to application of the guidelines:

- Any proposed changes in guidelines should be consistent with the EMF policy established in this decision [D.06-01-042] and in D.93-11-013.<sup>12</sup>
- The guidelines "should not compromise safety, reliability, or the requirements of [CPUC] General Orders (GO) 95 and 128."<sup>13</sup>
- Without exception, design and construction of electric power system facilities must comply with all applicable federal and state regulations, applicable safety codes, and each electric utility's construction standards.
- Non-routine field reduction measures are not necessary except in unique circumstances, and are not included in the guidelines.
- The guidelines do not include reduction measures "that are based on numeric values of EMF exposure."<sup>14</sup>
- Modeling is done for magnetic fields only.
- Modeling of magnetic fields is for comparison of reduction techniques, and "does not measure actual environmental magnetic fields."<sup>15</sup>
- "[P]ost-construction measurement of EMF in the field cannot indicate the effectiveness of mitigation measures"<sup>16</sup> and is not required.
- "The appropriate location for measuring EMF mitigation is the utility ROW as this is the location at which utilities may maintain access control."<sup>17</sup>
- Reduction measures are not applicable to reconfigurations or relocations of up to 2,000 feet, the distance under which certain exemptions apply under GO 131-D.<sup>18</sup>
- "Utility design guidelines should consider EMF mitigation at the time the FMP [(Magnetic) Field Management Plan] is prepared..." The CPUC does "not require utility design guidelines to include low-cost EMF mitigation for undeveloped land."<sup>19</sup>
- Distribution facilities are not considered in magnetic field modeling or in FMPs for transmission line or substation projects rated 50 kV and above.

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<sup>12</sup> Ibid., p. 20.

<sup>13</sup> Ibid., p. 21.

<sup>14</sup> Ibid., p. 17.

<sup>15</sup> Ibid., p. 11.

<sup>16</sup> Ibid., p. 11.

<sup>17</sup> Ibid., p. 20.

<sup>18</sup> The CPUC's General Order 131-D establishes rules and specifications for permitting and construction of electric generation, transmission and distribution facilities and substations located in California.

<sup>19</sup> Ibid., p. 9.

## **2 Methods for Reducing Magnetic Fields**

The following magnetic field reduction methods may be considered for new and upgraded electrical facilities:

- A) Increasing the distance from electrical facilities by:
  - a. Increasing structure height or trench depth.
  - b. Locating power lines closer to the centerline of the corridor.
- B) Reducing conductor (phase) spacing.
- C) Phasing circuits to reduce magnetic fields.

### **2.1 Increasing the Distance from Electrical Facilities**

Reducing magnetic field strength by increasing the distance from the source can be accomplished either by increasing the height or depth of the conductor from ground level. Furthermore, locating the power lines as far away from the edge of the right-of-way or as close to centerline as possible will result in lower field levels at the edge of the right-of-way. For substations, placing major electrical equipment, such as switch-racks and power transformers, near the center of the substation can reduce the magnetic field levels at the property line.

### **2.2 Reducing Conductor (Phase) Spacing**

The magnetic field produced by overhead and underground power lines is approximately inversely proportional to the distance between the phase conductors. Thus, reducing the spacing between conductors by 50 percent generally reduces the magnetic field at ground level by approximately 50 percent. The minimum distance between overhead conductors for power lines built in California is established by CPUC General Order (GO) 95. Utilities may establish minimum clearances greater than those allowed in GO 95 if required for safe working conditions or to prevent flash over. In most cases, insulation levels will be established based on lightning, switching surge, or insulator contamination considerations.

Because underground conductors are insulated, they may be placed within inches of each other. This means that there generally can be greater magnetic field cancellation in an underground circuit than an overhead circuit. Therefore, the magnetic field levels from an underground circuit will generally be lower than a comparably loaded overhead circuit at most locations other than directly above the underground line, where the cancellation effect of the underground conductors is offset by their proximity to the surface. In contrast, overhead conductors will be much farther away and will generally create a lower magnetic field directly under the line than a comparably loaded underground circuit.

### **2.3 Phasing Circuits to Reduce Magnetic Fields**

When two or more circuits share a pole or tower, the resultant magnetic field will be the vector sum of the individual conductor fields on the structure. By using proper phasing techniques, the field from one circuit can reduce the field from another circuit, thereby reducing the level of magnetic field at ground level.

## **3 The Field Management Plan Process**

### **3.1 The Field Management Plan**

The Field Management Plan (FMP) documents the consideration of no-cost and low-cost magnetic field reduction measures for new or significantly reconstructed transmission lines and substations rated 50 kV and above (refer to § 3.4 for exceptions).

FMPs will be prepared for relevant transmission projects and will be retained with the work order. For any project requiring a permit under GO 131-D, the FMP will be incorporated as a part of the GO 131-D filing.

Utilities have incorporated magnetic field reduction measures into their distribution construction and design standards. Therefore, FMPs are not prepared for any distribution projects.

Basic elements of the FMP include a project description, an evaluation of no-cost and low-cost magnetic field reduction measures, and specific recommendations regarding magnetic field reduction measures to be incorporated into the transmission line and substation design (see §§ 4 and 5 of these guidelines for additional information concerning the contents of transmission line and substation FMPs).

### **3.2 Types of FMP**

There are two types of FMP for transmission line projects, a “Basic FMP” and a “Detailed FMP,” and a “Checklist FMP” for substation projects.

For transmission line projects with limited work scope, as described in Table 3-1 below, a Basic FMP is sufficient to document no-cost and low-cost magnetic field reduction measures. The Basic FMP consists of a transmission line project description, applicable no-cost and low-cost magnetic field reduction measures without magnetic field model(s), and recommendations.

The Detailed FMP consists of a transmission line project description, evaluation of no-cost and low-cost magnetic field reduction measures, magnetic field models, and recommendations (refer to § 3.3 to determine what types of transmission line projects require a Detailed FMP).

For substation projects, a checklist FMP, showing an evaluation of magnetic field reduction measures adopted or rejected, will be used. An example of the Checklist FMP is shown on Table 5-1.

### **3.3 Determining If an FMP is Required, and If so, What Type**

The CPUC in Decision 93-11-013 (§ 3.4.2, p. 15) states, “Utility management should have reasonable latitude to deviate and modify their guidelines as conditions warrant and as new magnetic fields information is received.” Table 3-1 provides criteria to determine if the project requires a Detailed FMP, a Basic FMP, a Checklist FMP, or no FMP.

**Table 3-1 Criteria to Determine Whether an FMP is Required**

FMP Type Required	Type of Work	FMP Criteria
<b>Transmission Line (rated 50 kV and above)</b>		
<p><b>Detailed FMP</b></p> <p>Note: A Detailed FMP will be used for transmission line projects requiring permitting under GO 131-D.</p>	<p><b><u>New Transmission Line:</u></b> The construction of a new transmission line, if the construction requires permitting under GO 131-D.</p> <p><b><u>Major Upgrade:</u></b> Major upgrade (including replacement of a significant number of existing structures) on an existing transmission line, if the upgrade requires permitting under GO 131-D.</p>	<p>The construction of a new transmission line will incorporate no-cost and low-cost magnetic field reduction measures. Magnetic field model is required.</p> <p>All major upgrades of existing transmission lines will require no-cost and low-cost magnetic field reduction measures unless otherwise exempted under § 3.4.</p> <p>If permitting under GO 131-D is not required, a Basic FMP may be used, and magnetic field modeling is not required.</p>
<p><b>Basic FMP</b></p> <p>Note: A Basic FMP will be used unless the transmission line project requires permitting under GO 131-D.</p>	<p><b><u>Rule 20 Conversions:</u></b> Direct replacement of overhead transmission lines with underground transmission lines under Rule 20.</p> <p><b><u>Relocation more than 2000 ft:</u></b> Relocation of poles and/or towers involving more than 2000 feet of transmission line.</p> <p><b><u>Pole-head Reconfiguration more than 2000 ft:</u></b> Pole-head reconfiguration involving more than 2000 feet of transmission line. The complete replacement of an existing pole-head configuration with a new design.</p>	<p>The transmission line route generally is pre-established for Rule 20 conversions. Phase spacing and depth are set by utility construction standards. Thus, phase arrangement is the only magnetic field reduction measure available to the designer. Therefore, the Basic FMP will be restricted to an evaluation of phase arrangement. Magnetic field modeling is not required.</p> <p>Relocation of existing transmission lines generally does not provide for alternative transmission line routes. Available options are typically limited to minor changes in pole and/or tower height, minor changes in pole-head<sup>20</sup> configuration, or phase arrangement. The Basic FMP will normally cover these options only. Magnetic field modeling is not required.</p> <p>Pole-head replacement is limited in scope; thus, field management options are generally restricted to selecting the pole-head configuration and phase arrangement. In most cases, the new pole-head configuration must be consistent with the remainder of the line. The Basic FMP will be limited to an</p>

<sup>20</sup> It can also be referred to as “pole-top”

**Table 3-1 Criteria to Determine Whether an FMP is Required**

<b>FMP Type Required</b>	<b>Type of Work</b>	<b>FMP Criteria</b>
<p><b>Basic FMP</b></p> <p>Note: A Basic FMP will be used unless the transmission line project requires permitting under GO 131-D</p>	<p><b><u>Reconducting more than 2000 ft.:</u></b> Replacement only of existing conductors and/or insulators with new conductors and/or insulators.</p>	<p>assessment of alternative pole-head configurations and will not require magnetic field modeling.</p> <p>In most cases, replacement of existing transmission conductors is limited in scope; therefore, the Basic FMP will be limited to an assessment of phase arrangement for reconductor activity involving more than 2000 transmission circuit feet. Magnetic field modeling is not required.</p>
<p><b>None</b> (see exemptions § 3.4)</p>	<p><b><u>Relocation less than 2000 ft.:</u></b> Relocation of poles and/or towers involving less than 2000 feet of transmission line(s).</p> <p><b><u>Reconducting less than 2000 ft.:</u></b> Replacement only of existing conductors and/or insulators with new conductors and/or insulators.</p> <p><b><u>Pole-head Re-Configuration less than 2000 ft.:</u></b> Pole-head reconfiguration involving 2000 feet or less of a transmission line(s) will not require a FMP.</p> <p><b><u>Maintenance:</u></b> All maintenance work that does not materially change the design or overall capacity of the transmission line, including the one-for-one replacement of hardware, equipment, poles or towers.</p> <p><b><u>Safety and Protective Devices:</u></b> The addition of current transformers, potential transformers, switches, power factor correction, fuses, etc. to existing overhead, pad-mount, or underground circuits.</p> <p><b><u>Emergency Repairs:</u></b> All emergency work required to restore service or prevent danger to life and property.</p>	<p>Minor relocation of facilities is limited in scope and does not provide significant opportunity to implement magnetic field reduction measures.</p> <p>Replacement of existing transmission line conductors is limited in scope and does not provide significant opportunity to implement magnetic field reduction measures.</p> <p>Pole-head reconfiguration involving 2000 feet or less of a transmission line(s) will not require a FMP.</p> <p>Maintenance work is limited in scope and does not provide significant opportunity to implement magnetic field reduction measures. The addition of protective equipment or power factor correction to existing transmission circuits is limited in scope and does not provide significant opportunity to implement magnetic field reduction measures.</p> <p>This work is performed on existing facilities under emergency conditions and does not involve redesign.</p>

**Table 3-1 Criteria to Determine Whether an FMP is Required**

FMP Type Required	Type of Work	FMP Criteria
<b>Substation (Rated 50 kV and above)</b>		
<p><b>Checklist FMP</b></p>	<p><b><u>New Substations:</u></b> The construction of a new substation having a rated high side voltage of 50kV or above.</p> <p><b><u>Major Upgrade with GO 131-D:</u></b> Major reconstruction of an existing substation that involves the installation of <u>additional</u> transformers to achieve an increased rated capacity and that requires permitting under GO 131-D.</p> <p><b><u>Major Upgrade without GO 131-D:</u></b> Major upgrade of an existing substation that involves the installation of <u>additional</u> transformers to achieve an increased rated capacity and that does not require permitting under GO 131-D.</p>	<p>The construction of a new substation will incorporate no-cost and low-cost magnetic field reduction measures as outlined in §5. A no-cost and low-cost checklist<sup>21</sup> will be used as a part of the FMP.</p> <p>All major upgrade of existing substations will require evaluations of no-cost and low-cost magnetic field reduction measures as outlined in §5, unless otherwise exempted under § 3.4. A no-cost and low-cost check list may be used.</p> <p>Major substation upgrade projects involving the addition of new transformers but not requiring GO 131-D permitting may use a no-cost and low-cost check list only. The ‘no-cost and low-cost’ will be limited to an evaluation of magnetic field reduction measures applicable to the transmission get-away<sup>22</sup> and to the location of the new transformers so as to maximize the distance from the transformers to the substation fence.</p>

<sup>21</sup> See Section 5 for more information about no-cost and low-cost check lists for substation projects.

<sup>22</sup> This can be a part of Transmission FMP.

**Table 3-1 Criteria to Determine Whether an FMP is Required**

<b>FMP Type Required</b>	<b>Type of Work</b>	<b>FMP Criteria</b>
<p><b>None</b> (see exemptions § 3.4)</p>	<p><b><u>Reconstruction without installation of additional transformers:</u></b> This includes, for example, the installation of additional switchgear, line or bank positions, power factor correction capacitors, underground circuits and overhead circuits.</p> <p><b><u>Direct Replacement:</u></b> The direct replacement of substation equipment, even if the new equipment has a different capacity rating.</p> <p><b><u>Maintenance:</u></b> All maintenance work that does not materially change the design of the substation.</p> <p><b><u>Emergency Repairs:</u></b> All emergency work required to restore service or prevent danger to life and property.</p>	<p>The addition of switchgear or other apparatus is limited in scope and does not provide significant opportunity to implement magnetic field reduction measures.</p> <p>The direct replacement of substation equipment is limited in scope and does not provide significant opportunity to implement magnetic field reduction measures.</p> <p>Maintenance work is limited in scope and does not provide significant opportunity to implement magnetic field reduction measures.</p> <p>This work is performed on existing facilities under emergency conditions and does not involve redesign.</p>
<p><b>Distribution Project (Rated less than 50 kV)</b></p>		
<p><b>None</b></p>	<p>Construction or reconstruction of distribution lines with voltages less than 50 kV.</p>	<p>Each electric utility's distribution construction and design standards incorporates magnetic field reduction measures for distribution lines.</p>

### 3.4 Projects Exempt from the FMP Requirement

The CPUC, in Decision 93-11-013, recognized that some flexibility was required in the EMF Design Guidelines. In section 3.4.2 of the Decision, the CPUC stated: “Electric utility management should have flexibility to modify the guidelines and to incorporate additional concepts and criteria as new EMF information becomes available. However, if the EMF Design Guidelines are to be truly used as guidelines, the utilities should incorporate criteria which justify exempting specific types of projects from the guidelines.”

The following criteria to determine those transmission and substation projects exempted from the requirement for consideration of no-cost and low-cost magnetic field reduction measures:

1. Emergency
  - All work required to restore service or remove an unsafe condition.
2. Operation & Maintenance
  - Washing and switching operations.
  - Replacing cross-arms, insulators, or line hardware.
  - Replacing deteriorated poles.
  - Maintaining underground cable and vaults.
  - Replacing line and substation equipment with equipment serving the same purpose and with similar ratings.
  - Repairing line and substation equipment.
3. Relocations
  - Line relocation of up to 2000 feet.
  - Installation of guy poles or trenching poles only.
4. Minor Improvements
  - Addition of safety devices.
  - Reconductoring up to 2000 feet, where changing pole-head configuration is not required.
  - Installation of overhead switches.
  - Insulator replacement.
  - Modification of protective equipment and monitoring equipment.
  - Intersetting of additional structures between existing support structures.
5. Projects located exclusively adjacent to undeveloped land—including land under the jurisdiction of the National Park Service, the State Department of Parks and Recreation, U.S. Forest Service, or Bureau of Land Management (BLM).

### **3.5 Prioritizing Within and Between Land Use Classes**

The CPUC stated in Decision 06-01-042, “[a]lthough equal mitigation for an entire class is a desirable goal, we will not limit the spending of EMF mitigation to zero on the basis that not all class members can benefit.”<sup>23</sup>

While Decision 06-01-042 directs the utilities to favor schools, day-care facilities and hospitals over residential areas when applying low-cost magnetic field reduction measures, prioritization within a class can be difficult on a project case-by-case basis because schools, day-care facilities, and hospitals are often integrated into residential areas, and many licensed day-care facilities are housed in private homes that can be easily moved from one location to another. Therefore, utilities may group public schools, licensed day-care centers, hospitals, and residential together to receive highest prioritization for low-cost magnetic field reduction measures. Commercial and industrial areas may be grouped as a second priority group, followed by recreational and agricultural areas as the third group. Low-cost magnetic field reduction measures will not be considered for undeveloped land such as open space, state and national parks, Bureau of Land Management and National Forest Service Land.

When spending for low-cost measures would otherwise disallow equitable magnetic field reduction for all areas within a single land-use class, prioritization can be achieved by considering location and/or density of permanently occupied structures on lands adjacent to the projects, as appropriate.

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<sup>23</sup> Ibid., p. 10

## **4 Field Management Plans for Transmission Lines**

Construction of a new transmission line or the major upgrade of an existing transmission line, if they require GO-131D permitting, or the relocation of 2000 feet or more of an existing transmission line will require the preparation of a FMP; refer to § 3.3 to determine if a Detailed FMP (or Basic FMP) is needed; refer to § 3.4 for exemption criteria.

Transmission FMPs should include the following sections:

- Project Description;
- Evaluation of No-Cost Magnetic Field Reduction Measures;
- Evaluation of Low-Cost Magnetic Field Reduction Measures; and
- Recommendations including a table showing magnetic field reduction measures.

In addition to these requirements, a two-dimensional (2D) magnetic field model is required for a Detailed FMP.

### **4.1 Project Description**

The project description portion of the transmission line FMP will include the following:

- For a Detailed FMP, the proposed line route should be shown on an attached project map illustrating the transmission line route, alternative line route (if applicable), and major streets and highways. A Basic FMP should briefly describe the scope of work including the line route;
- Description of land use adjacent to the line route for both Basic and Detailed FMPs;
- Circuit name and rated voltage, and circuit phasing if more than one circuit is present in the same corridor for both Basic and Detailed FMPs (rated 50 kV and above);
- Description of proposed design. For a Detailed FMP, include circuit configuration, and minimum ground clearance for overhead design. For a Basic FMP, include circuit configuration. For underground facilities (for both Detailed FMP or Basic FMP), show the depth and configuration of duct bank;
- Include estimated total project costs for proposed design.(for a Detailed FMP).

### **4.2 Two-Dimensional Magnetic Field Modeling for Transmission Line**

The purpose of magnetic field modeling is to evaluate relative effectiveness of various magnetic field reduction measures, not to predict magnetic field levels, as the CPUC recognized in Decision 06-01-042:

“Utility modeling methodology is intended to compare differences between alternative EMF mitigation measures and not determine actual EMF amounts.”<sup>24</sup>

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<sup>24</sup> Ibid., p. 20

“... the modeling indicates relative differences in magnetic field reductions between different transmission line construction methods, but does not measure actual environmental magnetic fields. In the same way, these relative differences in mitigation measures will be evident regardless of whether a maximum peak or a projected peak is used for the comparisons... It is also true that post construction measurement of EMF in the field cannot indicate the effectiveness of mitigation measures used as it would be extremely difficult to eliminate all other EMF sources.”<sup>25</sup>

Two-dimensional magnetic field software can be used to evaluate the magnetic field characteristics of the proposed construction and various magnetic field reduction alternatives. Estimates of magnetic field levels are calculated based on a specific set of conditions. Therefore, it is important to make logical assumptions as to what these conditions will be and to keep these calculation conditions consistent when comparing two or more different cases.

Typical two-dimensional magnetic field modeling assumptions include:

- The line will be considered operating at forecasted design load;
- Magnetic field strength is calculated at a height of three feet above ground (assuming flat terrain);
- Resultant magnetic fields are being used;
- All line loadings are considered as balanced (i.e. neutral or ground currents are not considered);
- The line is considered working under normal operating conditions (emergency conditions are not modeled);
- Terrain is flat;
- Dominant power flow directions are being used; and
- Contribution of shield wire currents is not included.

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<sup>25</sup> Ibid., p. 11

CERTIFICATE OF SERVICE BY HAND DELIVERY

I, the undersigned, state that I am a citizen of the United States and am employed in the City and County of San Francisco; that I am over the age of eighteen (18) years and not a party to the within cause; and that my business address is 77 Beale Street, B30A, San Francisco, California 94105

On April 30, 2010, I served a true copy of:

**APPLICATION OF PACIFIC GAS AND ELECTRIC COMPANY  
FOR A PERMIT TO CONSTRUCT THE  
CRAZY HORSE CANYON SWITCHING STATION PROJECT**

by hand delivery, addressed to:

Jenny Au  
Division of Ratepayer Advocates  
California Public Utilities Commission  
505 Van Ness Avenue  
San Francisco, CA 94102

Andrew Barnsdale (and Exhibit A CD in Word format)  
Energy Division  
California Public Utilities Commission  
505 Van Ness Avenue  
San Francisco, CA 94102

I certify and declare under penalty of perjury under the laws of the State of California that the foregoing is true and correct.

Executed on this 30<sup>th</sup> day of April, 2010 at San Francisco, California.

*/s/ Donna Lee*

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DONNA LEE